

CLAIMS

1. A light emitting element comprising:

a first layer for generating a hole;

5 a second layer for generating an electron; and

a third layer comprising a light emitting substance,

wherein the first layer, the second layer and the third layer are interposed  
between a first electrode and a second electrode;

10 wherein the second layer is interposed between the first layer and the third  
layer;

wherein the first layer is in contact with the first electrode; and

wherein the light emitting element emits light when a voltage is applied  
between the first electrode and the second electrode such that a potential of the first  
electrode is higher than that of the second electrode.

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2. A light emitting element comprising:

a first layer comprising a first substance and a second substance;

a second layer comprising a third substance and a fourth substance; and

a third layer comprising a light emitting substance,

20 wherein a hole transporting property of the first substance is stronger than an  
electron transporting property thereof;

wherein a second substance has an electron accepting property to the first  
substance;

25 wherein an electron transporting property of the third substance is stronger than  
a hole transporting property thereof;

wherein a fourth substance has an electron donating property to the third  
substance;

wherein the first layer, the second layer and the third layer are interposed  
between a first electrode and a second electrode;

30 wherein the second layer is interposed between the first layer and the third

layer;

wherein the first layer is in contact with the first electrode; and

wherein the light emitting element emits light when a voltage is applied between the first electrode and the second electrode such that a potential of the second  
5 electrode is higher than that of the first electrode.

3. The light emitting element according to claim 2, wherein a molar ratio of the second substance to the first substance is 0.5 to 2.

10 4. A light emitting element comprising:

a first layer comprising a p-type semiconductor;

a second layer comprising an n-type semiconductor; and

a third layer comprising a light emitting substance,

wherein the first layer, the second layer and the third layer are interposed  
15 between a first electrode and a second electrode;

wherein the second layer is interposed between the first layer and the third  
layer;

wherein the first layer is in contact with the first electrode; and

wherein the light emitting element emits light when a voltage is applied  
20 between the first electrode and the second electrode such that a potential of the second  
electrode is higher than that of the first electrode.

5. A light emitting element comprising:

a first layer comprising 4, 4'-bis[N-(1-naphthyl)-N-phenylamino] biphenyl and  
25 molybdenum oxide;

a second layer comprising tris(8-quinolinolato)aluminum and lithium; and

a third layer comprising a light emitting substance,

wherein the first layer, the second layer and the third layer are interposed  
between a first electrode and a second electrode;

30 wherein the second layer is interposed between the first layer and the third

layer;

wherein the first layer is in contact with the first electrode; and

wherein the light emitting element emits light when a voltage is applied between the first electrode and the second electrode such that a potential of a second  
5 electrode is higher than that of the first electrode.

6. The light emitting element according to claim 5, wherein a molar ratio of molybdenum oxide to 4, 4'-bis[N-(1-naphthyl)-N-phenylamino]biphenyl is 0.5 to 2.

10 7. A light emitting element comprising:

a first layer comprising a first substance and a second substance;

a second layer comprising a third substance and a fourth substance; and

a third layer comprising x pieces of layers (x is a given positive integer),

wherein the first electrode comprises a conductive material having a  
15 reflectance;

wherein the second electrode comprises a conductive material that can transmit a visible light;

wherein the n pieces of layers comprises a light emitting layer;

wherein the first layer, the second layer and the third layer are interposed  
20 between a first electrode and a second electrode;

wherein the second layer is interposed between the first layer and the third layer;

wherein a hole transporting property of the first substance is stronger than an electron transporting property thereof;

25 wherein a second substance has an electron accepting property to the first substance;

wherein an electron transporting property of the third substance is stronger than a hole transporting property thereof;

30 wherein a fourth substance has an electron donating property to the third substance;

wherein the first layer is in contact with the first electrode;

wherein one layer of the n pieces of layers is in contact with the second layer;

wherein y pieces of layers (y < x, and y is a positive integer) are provided between the light emitting layer and the second layer;

5 wherein the light emitting element emits light when a voltage is applied thereto such that a potential of the second electrode is higher than that of the first electrode; and

wherein a thickness of the first layer and a thickness of the second layer satisfy expressions 1, 2 and 3 below:

$$n_i d_i + n_{ii} d_{ii} + \sum_{k=1}^y n_k d_k + n_j d_j = \frac{(2m-1)\lambda}{4} \quad \cdot \cdot \cdot 1$$

$$10 \quad 0 \leq d_j \leq d_{emi} \quad \cdot \cdot \cdot 2$$

$$d_i \geq d_{ii} \quad \cdot \cdot \cdot 3$$

wherein in the expressions 1, 2 and 3,  $n_i$  indicates a refractive index of the first layer;  $d_i$ , a thickness of the first layer;  $n_{ii}$ , a refractive index of the second layer;  $d_{ii}$ , a thickness of the second layer;  $n_k$ , a refractive index of a  $k^{\text{th}}$  layer of the layers sandwiched between the light emitting layer and the second layer;  $d_k$ , a thickness of the  $k^{\text{th}}$  layer of the layers sandwiched between the light emitting layer and the second layer;  $n_j$ , a refractive index of the light emitting layer;  $d_j$ , a distance between a surface of the light emitting layer in the first electrode side and a light emitting region;  $\lambda$ , a wavelength of light emission from the light emitting element; m, a given positive integer; and  $d_{emi}$ , a thickness of the light emitting layer.

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8. The light emitting device comprising the light emitting element according to claim 1.

25 9. The light emitting element according to claim 1, wherein the light emitting element is incorporated into a display portion of an electronic appliance.

10. The light emitting device comprising the light emitting element according to claim 2.

11. The light emitting element according to claim 2, wherein the light emitting  
5 element is incorporated into a display portion of an electronic appliance.

12. The light emitting device comprising the light emitting element according to claim 4.

10 13. The light emitting element according to claim 4, wherein the light emitting element is incorporated into a display portion of an electronic appliance.

14. The light emitting device comprising the light emitting element according to claim 5.

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15. The light emitting element according to claim 5, wherein the light emitting element is incorporated into a display portion of an electronic appliance.

16. The light emitting device comprising the light emitting element according to claim 7.

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17. The light emitting element according to claim 7, wherein the light emitting element is incorporated into a display portion of an electronic appliance.

18. The light emitting element according to claim 1, wherein the third layer is in contact with the second electrode.

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19. The light emitting element according to claim 2, wherein the third layer is in contact with the second electrode.

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20. The light emitting element according to claim 4, wherein the third layer is in contact with the second electrode.

21. The light emitting element according to claim 5, wherein the third layer is in contact with the second electrode.

22. The light emitting element according to claim 7, wherein the conductive material has a reflectance of 50 to 100%.

23. The light emitting element according to claim 7, wherein an  $x^{\text{th}}$  layer comprised in the third layer is in contact with the second electrode.

24. The light emitting element according to claim 7, wherein a molar ratio of the second substance to the first substance is 0.5 to 2.

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25. The light emitting element according to claim 1,

wherein the first layer comprises a first substance having a hole transporting property and a second substance having an electron accepting property to the first substance; and

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wherein a molar ratio of the second substance to the first substance is 0.5 to 2.

26. The light emitting element according to claim 1, wherein the second layer comprises DNTPD.

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27. The light emitting element according to claim 2, wherein the first substance is DNTPD.

28. The light emitting element according to claim 7, wherein the first substance is DNTPD.

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29. The light emitting element according to claim 1, wherein the first layer is in contact with the second layer.

30. The light emitting element according to claim 1, wherein the second layer  
5 is in contact with the third layer.

31. The light emitting element according to claim 2, wherein the first layer is in contact with the second layer.

10 32. The light emitting element according to claim 2, wherein the second layer is in contact with the third layer.

33. The light emitting element according to claim 4, wherein the first layer is in contact with the second layer.

15 34. The light emitting element according to claim 4, wherein the second layer is in contact with the third layer.

35. The light emitting element according to claim 5, wherein the first layer is in  
20 contact with the second layer.

36. The light emitting element according to claim 5, wherein the second layer is in contact with the third layer.

25 37. The light emitting element according to claim 7, wherein the first layer is in contact with the second layer.

38. The light emitting element according to claim 7, wherein the second layer is in contact with the third layer.

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